Maturation of Human Oocytes for SCNT and Embryonic Stem Cell Derivation

Grant Award Details

Maturation of Human Oocytes for SCNT and Embryonic Stem Cell Derivation

Grant Type: Basic Biology II

Grant Number: RB2-01553

Project Objective: The project objective is to derive mature human oocytes from otherwise rejected material, such as immature oocytes obtained for IVF and ovarian tissue removed during cancer surgery. The matured human oocytes will then be used to attempt SCNT followed by hESC derivation.

Investigator:

Name:	Aaron Hsueh
Institution:	Stanford University
Type:	PI

Disease Focus: Fertility

Human Stem Cell Use: SCNT

Cell Line Generation: SCNT

Award Value: $1,309,018

Status: Closed

Progress Reports

Reporting Period: Year 1

View Report

Reporting Period: Year 2

View Report

Reporting Period: Year 3

View Report

Grant Application Details

Application Title: Maturation of Human Oocytes for SCNT and Embryonic Stem Cell Derivation

Public Abstract: A major issue for tissue and cell therapy in regenerative medicine is the immune rejection of grafts originated from a non-compatible individual. Mature eggs contain factors essential for the re-programming of cell nuclei from patients to allow the establishment of patient-compatible pluripotent stem cells for the treatment of diverse degenerative diseases. Although up to half a million dormant small follicles are present in young women reaching puberty, only 400 of them developed to the large follicle stage and release mature eggs during a women's reproductive life. The present application proposes to overcome the major obstacle dealing with the shortage of human mature oocytes for the generation of patient-compatible pluripotent stem cells. The {REDACTED} preserved ovarian tissues from cancer patients before chemo- and radiation therapy to avoid damages. We have obtained patients' consent and propose to promote the growth of arrested small follicles from ovaries of cancer patients with specific activators to allow the development of hundreds of large follicles containing mature eggs. The surplus eggs can be used to re-program cell nuclei from patients, thus allowing the generation of patient-compatible pluripotent stem cells for the treatment of diverse degenerative diseases. After identifying key embryonic hormonal factors important for the optimal growth of human early embryos in the test tube, we will promote the development of re-programmed cells with hormone-enriched culture media for the generation of patient-compatible stem cell lines. In addition to providing pluripotent stem cells for future generation of diverse cells in the body (neurons, muscles, pancreatic insulin-producing cells, etc), the present generation of mature oocytes will benefit cancer patients and diverse infertile women who still have arrested small follicles but are unable to respond to the present gonadotropin therapy.

Statement of Benefit to California: Because human ovaries contain thousands of arrested small follicles and only a few of them grow into large follicles containing mature eggs, we devised a new approach to promote the growth of these dormant follicles to generate a large surplus of mature oocytes. Future adaptation of this procedure for the re-programming of the nuclei of cells from patients with degenerative diseases will allow the generation of patient-compatible pluripotent cell lines. Because these cells can be induced into diverse cell types of the body, establishment of optimal culture conditions for the derivation of these cells would allow new approaches for assisted reproductive technologies and provide new treatment modalities for diverse patients with degenerative diseases.
We will submit patent applications on our findings to protect intellectual property rights according to {REDACTED} guidelines. In addition to applications in regenerative medicine, the present findings are also expected to substantially broaden the patient population for and improve the success rate of in vitro fertilization procedures that are presently used for an estimated one million treatment cycles per year worldwide. We anticipate the successful completion of the present proposal could benefit patients with degenerative diseases and infertility in California and throughout the world. The P.I. already has a pending patent application on the use of brain-derived neurotrophic factor in the promotion of early embryo development. We expect future findings will lead to additional patent applications and licensing agreements that would benefit the State of California.